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Math of The Lottery

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If you are thinking about probability as the basis of a lottery, this story has nothing to do with that. Yet, the whole thing took place in a middle-school math class. Ms. Modell is not a usual math teacher. She hates the way the state and the district dictate what to teach and how to teach math. These days, she is even told to "tailor" her lessons to the CCRAP test. But since she is sort of defiant in nature, she does not easily yield. She isn't even afraid of losing her job. She has a strong sense of what is right and what needs to be done.

Most of the students have a strong sense of likes and dislikes. They don't like doing boring things that can be done with a calculator. They don't like manipulating symbols that don't appeal to them or don't even make sense at all. They don't like following the specific procedures that would appear on the CCRAP test but will never be in use in real life. But what they hate most is homework. The good news is that there is none of these in Ms. Modell's class.

As for the parents, the reactions are clearly divided. A smaller number of parents welcome Ms. Modell's approach wholeheartedly. They understand what their children are saying, thinking, and feeling. This is because they themselves were like that before. The remaining parents, a larger group, resist Ms. Modell strongly. They think that Ms. Modell does not "educate" the children properly in preparation for the high-stake exams, prestigious colleges, and high-paying jobs. Many of these parents are not really paying attention to what their children are thinking or feeling. And their children have learned not to express their real thoughts and emotions to their own parents. Of course, these children are well aware that their parents' childhood was no different from theirs. The children know that

their parents are actually "faking." The children know that their parents are preoccupied with their own "secure" retirement served by their rich children. They believe that in order to achieve that (secret) goal, their children must achieve good grades and go to a prestigious college. Following what the state, the district, and the teachers say is a prerequisite. I don't know if you are a parent and/or understand any of these. But I guess intelligent and honest people should be able to see the underlying structure.

Anyway, let's observe what Ms. Modell is doing these days. One day, she started the lesson involving a short story. She knew that all the students in her class had read *The Lottery* by Shirley Jackson in their language arts classes. So, the class didn't actually need to re-read the story. She just reminded her students that they were going to discuss the *continuation* stories which the students wrote in the language arts classes.

Naturally, the students were puzzled. Isn't this a math class and not a language arts class? But by this time, the students were getting used to the way Ms. Modell teaches. Actually, she didn't "teach" much as in a usual sense. She always started her class by *listening* to her students. Every day, the class begins with a talking circle. Every student has a turn to share whatever she or he wants to share. There is no set time limit. But if a student begins to dominate, Ms. Modell intervenes and ask the student to have a lunch with her and continue the story then. After the round, students tend to be calm. If Ms. Modell identifies a source of concern, she address it in various ways. Sometimes, she refers students to the student counselor. Many times, she just invites students to have lunch with her.

This talking circle was an essential tool for Ms. Modell. She gets to know what her students are up to. She knows that if her students are preoccupied with some immediate issues, there won't be room for classroom discussions. Another crucial aspect of the talking circle is that Ms. Modell is able to find topics that would interest her students. Many times, Ms. Modell picks up math concepts in the students' stories and starts the day's lesson based on that topic. For example, after the summer break, a few students talked about their trips. Ms. Modell tactically introduced the connection between time and distance. Talking about driving, stopping, accelerating, etc., she even touched upon the very basics of calculus (without using any of the conventional terminology). Of course, none of her students would notice "calculus" per se. They just realized that there is math involved in such a topic.

Sorry about the digression. Back to *The Lottery*. So, working on the continuation of *The Lottery* seemed odd but the students became curious about what she was really trying to do. You know that children are much more adaptive to new environments ... than, say, you are (assuming that you are not a child). Ms. Modell asked her students, "What were you told to do when you were to write your own continuation of *The Lottery*?" The students responded with a variety of points: Consistency with the original story, appropriate use of the old and new characters, reasonable transition across time since the original story, etc.

Then, here is the point Ms. Modell emphasized. The students' *continuation* stories must satisfy certain conditions. For example, at the beginning of their stories, all the conditions

must be the same as the end point of the original story. Of course, the students were free to divert from the original story, as long as their ideas are clearly stated. In response to Ms. Modell's question about the conditions at the end of the original story, the students worked in small groups of two or three students. After the discussion, Ms. Modell collected the students' ideas and put them on the board. Here is the list:

- In this town, the lottery continues since the first settlers.
- The population of the town increased over time.
- The lottery is practiced in other towns as well. However, some towns have quit the tradition (This situation was referred to as "trouble" by an old-timer).
- The event was practiced in a matter-of-fact way. Except for Tessie, nobody else resisted.
- The interaction among town people were not unnatural. Mr. Summers behaved formally.
- The friends of Nancy didn't want Nancy to win the lottery because they didn't want to lose their play mate.
- Only the smoothest and roundest stones were piled up at the corner of the town center.
- Tessie repeatedly said, "unfair." She was defiant and eventually hit by a stone on the side of her head.
- Other town people insisted "good sport." They were "upon her" at the end of the story.

Then, Ms. Modell asked for some volunteers to use their stories to discuss whether their continuation stories satisfy the listed conditions. Whenever Ms. Modell asks students to share their work, she emphasizes that there is no competition. She asks her students to value the difference but not to compare their work as better or worse. She also emphasizes that there be no punishments or rewards, regardless of what her students do or don't. If there are problems, she certainly addresses them. She does it in a fair manner or sometimes privately.

A few hands shot up. Whenever there are multiple volunteers, the students decide who goes first. This time, Kevin got the first spot. Since the students had already discussed their continuation stories, Ms. Modell asked them to give just the gist of their stories.

Kevin's story started immediately after the original story ended. As soon as a few stones hit Tessie, a super hero called "Ratman" showed up and saved Tessie. Then, both of them disappeared. The town people were stunned. Since there was no precedence, the town people needed to figure out what to do. Some argued for the need of another person to take Tessie's place. Some argued that since Tessie disappeared, there was nothing else to do. After a heated discussion, the town people decided to repeat the process from the beginning. This time, Mr. Summers won the lottery. Mr. Summers' behavior was just like that of Tessie. He said, "it's not fair." Kevin's story ended when the first stone hit Mr. Summers.

Ms. Modell asked the students whether Kevin's story satisfies the listed conditions. The students found nothing that contradicted the conditions. In particular, the students argued that the introduction of Ratman did not contradict the conditions simply because there was no condition that would prevent it. Analogously, there was no conditions about what would happen in such an unexpected situation. So, Kevin was free to develop his story. The behavior of the town people appears consistent. Mr. Summers' behavior mirrors that of Tessie. However, since Mr. Summers is not Tessie, the conditions do not constrain the behavior of Mr. Summers in any way. Kevin simply chose that Mr. Summers would behave like Tessie.

Through the discussion, the students realized that it was quite easy to satisfy the conditions and be creative at the same time. Many of them even thought that it would be harder to violate the conditions. The class moved on.

The second volunteer was Amanda. Amanda's continuation story began one month after the original story ended. Her story assumed that Tessie had been executed. One of Tessie's children, Nancy, is still grieving the loss of her mother. When Nancy had to throw stones to Tessie, Nancy intentionally missed Tessie. It was unbearable for Nancy to watch her mother being executed in front of her eyes. She had seen executions earlier. But this time had a completely different meaning to her. For the last one month, Nancy was often wandering in the forest, crying. Then, one day, she found a strange box with many dials and a large red button. Out of curiosity, she just changed some of the dials and hit the red button. All of sudden, Nancy was in the town center and Tessie was sitting in the middle of the square. It was exactly the same as that terrible morning. The only difference was that she had that strange box. She was so glad to see her mother alive again. Maybe she could save her. But people started to throw stones again and Tessie was executed ... again. She experienced the same shock. But this time, she quickly changed her attention to the strange box. She thought that it was a time machine. She again changed some dials and pressed the button. All of sudden, she was in her house, in the morning. She checked the newspaper and immediately realized that it was the day of Tessie's execution. Nancy grabbed Tessie's hand and shouted, "Mama, let's escape this town. I can't explain this now. But I don't want to lose you." Tessie was completely puzzled. Not knowing what else to do, Nancy started to run. She literally ran away. Tessie had to stop her. So, Tessie ran after Nancy. Nancy ran and ran and ran. Tessie followed Nancy all the way to the end of the world.

When Amanda shared her story in a language arts class, other students liked it so much. But for Ms. Modell's class, the students were specifically asked about the conditions. The students agree that the beginning of Amanda's story was absolutely consistent with the original story. However, when it came to the part Nancy time-traveled back to the morning of Tessie's execution day, the student's opinions were divided. To most students, Nancy and Tessie's escape from the village was clearly inconsistent with the original story. They argued that there cannot be two different scenarios for exactly the same time and place. Another said it in a different way. If time travel to the past is possible, even the present situation can be changed in a way inconsistent to the situation before the time travel. But

yet another student raised the possibility of multiple universes. That is, there can be many universes at the same time. For him, time travel even to the past could be just stepping into a different universe. Since the conditions do not exclude the existence of multiple universes, this is not necessarily contradictory.

Ms. Modell didn't try to conclude the discussions. She didn't give any authoritative statement either. She just ended the discussion right there. She said, "Well, there are many things that cannot be resolved in a straightforward manner. In fact, all the important questions do not admit simplistic, unique answers. That's why standard tests *always* fail."

Then, Ms. Modell talked a little bit more about conditions and stories. "This sort of connection between conditions and stories are everywhere. For example, when we read a mystery, you find various "clues." The detective will come up with possible "crime scenes." Of course, the detective's job is to recreate crime scenes that would satisfy the clues, or conditions. There can be many, many possible scenes. So, understanding the connection between conditions and scenarios is extremely important.

"And if you didn't notice, this *is* math. The *real* math. Everyone makes a big deal out of numbers and arithmetic. But those are just a tip of the mathematical iceberg. For example, the idea of whole number, that is, non-negative integers, can be precisely described in a certain set of conditions. But real mathematicians know that that kind of construction is not as simple as one might think. There are a lot of loop holes. Next, if I write this, '1 + 1 = 10', you might think this is *wrong*. But it can be a perfectly "correct" statement. For example, one set of conditions that make this true is the conditions for binary numbers. You know, computers deal with binary numbers made out of 0's and 1's, corresponding the OFF and ON of electronic switches. So, I don't want you to be stuck with the kind of math you normally learn in school. Always be creative. You are the people who have to solve all the challenging real-world problems left by adults.

"I think I talked too much already. When you have a chance, think about the connection between conditions and possibilities. That's all for today."

Ms. Modell didn't have time to discuss any more *continuation* stories. But I thought you might find the following two short stories intriguing.

The Lottery Continuation Story by Jeff M.

Hundreds of years passed since Tessie was killed. The tradition continued. However, as the industrial revolution took place, the tradition gradually evolved into a new form. Stones were replaced by guns and grenades. The paper slips were replaced by letters from the government. As more and more communities consolidate their effort to streamline the tradition, the federal government took over the business of conducting the lottery. One form of the lottery came as military draft. The preliminary winners join the military forces.

The real winners were chosen most commonly in a remote field.

Dozens more years passed since then. There are no more major wars. There was no need for draft. So, the tradition evolved into yet another form. Inefficient fire arms have been replaced by semi-automatic rifles. The lottery is now being conducted by a small number of sociopaths. Due to certain irregularities associated with these people, the timing of the lottery became rather unpredictable. Due to the lack of overseeing body, the formality and fairness became things of the past. Due to the efficiency of the new tools, multiple winners can be chosen at once. This has been the case more and more often.

Regardless of the differences involved in these different forms of lottery, the essence remains the same. The majority of people don't pay enough attention to the absurdity of the lottery. They don't even try to eliminate it.

(End of Jeff's story)

The Lottery Continuation Story by Tara S.

The tradition of the lottery continues to this date. In our area, it is called *Mega Billions*. You might think that Shirley Jackson's *Lottery* and the current-day *Mega Billions* are completely different or even opposite. You are wrong.

Of course, there are certain similarities. Both forms of lotteries are conducted by the "officials." The drawing is monitored and supposedly fair. They are done at regular intervals and the events are publicly announced.

Now, here is the tricky part. That is, the point you must have missed. As for Jackson's *Lottery*, people were definitely *not* excited to win. They handled it in a matter-of-fact way. But the town people certainly had dark feelings about it. Nowadays, people are *really* excited to win *Mega Billions*. They *really* think that winning *Mega Billions* is a ticket to the land of eternal happiness. Of course, this is wrong. The data clearly show that every one of the winners ends up with a miserable life. They are no longer hit by stones or killed by them. However, their lives will be destroyed completely and forever.

One more point. Unlike Jackson's *Lottery*, the fate of winning *Mega Billions* can easily be avoided. You just don't buy that ticket to failure. Good luck.

(End of Tara's story)